TENNESSEE DEPARTMENT OF EDUCATION
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Advanced Food Science

Primary Career Cluster:	Agriculture, Food and Natural Resources
Consultant:	Steven Gass, (615) 532-2847, Steven.Gass@tn.gov
Course Code(s):	6113
Prerequisite(s):	*Food Science and Safety* (6115)
Credit:	1
Grade Level:	12
Graduation Requirements:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Agriculture courses.
Programs of Study and Sequence:	This is the fourth and final course in the *Food Science* program of study.
Aligned Student Organization(s):	FFA: http://www.tnffa.org Allie Ellis, (615) 253-5207, Allie.Ellis@tn.gov
Coordinating Work-Based Learning:	All Agriculture students are encouraged to participate in a Supervised Agricultural Experience (SAE) program. In addition, Teachers are encouraged to use embedded WBL activities. For information, visit http://tn.gov/education/cte/work_based_learning.shtml.
Available Student Industry Certifications:	None
Dual Credit or Dual Enrollment Opportunities:	There are no statewide dual credit/dual enrollment opportunities for this course. If interested in establishing a local opportunity, reach out to a local postsecondary institution.
Teacher Endorsement(s):	048, 150, 448
Required Teacher Certifications/Training:	None
Teacher Resources:	http://www.tn.gov/education/cte/AgricultureFoodNaturalResources.shtml

Course Description

Advanced Food Science is an applied course designed to prepare students for further education and careers in food science and technology. This course covers advanced principles of food science, characteristics and properties of food products, processing and grading techniques and skills, and food labeling and packaging principles. Upon completion of this course, proficient students will be able to pursue advanced training in food science at a postsecondary institution. Standards in this course are aligned with Tennessee State Standards for English Language Arts & Literacy in Technical Subjects, Tennessee State Standards in Mathematics, and National Agriculture, Food and Natural Resources Career Cluster Content Standards.*

Approved April 10, 2015

Program of Study Application

This is the fourth and final course in the *Food Science* program of study. For more information on the benefits and requirements of implementing this program in full, please visit the Agriculture, Food and Natural Resources website at http://www.tn.gov/education/cte/AgricultureFoodNaturalResources.shtml.

Course Standards

Introduction to Food Processing

1) Use local news media, organizational websites, and real-time labor market information to investigate occupations in food science. Compare and contrast the knowledge, skills, and abilities necessary for employment, as well as the typical level of education required. (TN Reading 2, 9; TN Writing 4, 7, 9)

2) Summarize how principles of food science are applied for the conversion of agricultural commodities into consumer products. Determine how food safety techniques applied in the home, at retail establishments, and in industrial food processing environments benefit human health. (TN Reading 2, 7, 9; TN Writing 9)

3) Review common laboratory safety procedures for tool and equipment operation in the food science laboratories, including but not limited to accident prevention and control procedures. Demonstrate the ability to follow safety and operational procedures in a lab setting and complete a safety test with 100 percent accuracy. (TN Reading 3)

4) Demonstrate the ability to prepare basic personal and business records to complete taxes, employment, and SAE related applications, including resume, budgets, income statements, balance sheets, cash flow statements, profit and loss statements, and equity statements. (TN Reading 3; TN Writing 4; TN Math N-Q)

Processing and Evaluation of Red Meat

5) Identify major species and breeds of livestock utilized for red meat production. Describe the fabrication, processing, packaging, and quality analysis of red meats and their by-products.

6) Explain carcass preparation and fabrication procedures and identify associated equipment, safety, sanitation, and quality control procedures. Demonstrate in a live setting or in a presentation format the ability to identify wholesale and retail cuts of meat and meat by-products, and correlate them to major muscle groups. (TN Reading 3)

7) Analyze the United States Department of Agriculture (USDA) inspection and grading procedures and compose an argumentative essay justifying their purpose in the food industry, developing claim(s) and counterclaim(s) with specific evidence from case studies found in news media. Describe the principles of quality and yield grading. Demonstrate in a live setting or in a presentation format the ability to perform the evaluation and grading of carcasses, wholesale cuts, and retail cuts to determine maturity, final quality grade, and final yield grade, and provide written and oral justification for evaluation conclusions. (TN Reading 1, 3; TN Writing 1, 4, 9)

8) Demonstrate in a live setting or in a presentation the ability to perform methods of further processing fabrication for processed and value added products including comminuted meat products, emulsions, and cured meats. Using quantitative reasoning and appropriate units, calculate proper meat product formulations based upon required protein levels and USDA allowances for various products. (TN Reading 3; TN Math N-Q)

Processing and Evaluation of Milk and Dairy Products

9) Identify major breeds of livestock utilized for dairy production. Describe the products, by-products, processing, packaging, and quality analysis associated with each breed.

10) Summarize milk quality test and testing procedures in an explanatory narrative. Demonstrate in a live setting or in a presentation the ability to perform quality evaluations of milk and dairy products, providing written and oral justification for evaluation conclusions. (TN Reading 2, 3; TN Writing 2, 4)

11) Describe milk preparation and processing procedures, addressing procedures specific to equipment, safety, sanitation, and quality control. Analyze the composition of milk and examine concepts and principles that verify the scientific foundation for the pasteurization process. (TN Reading 3, 8; TN Writing 9; TN Math N-Q)

12) Identify varieties and characteristics of cultured and frozen milk products. Demonstrate in a live setting or presentation the ability to follow procedures used to process buttermilk, yogurt, and ice cream, attending to appropriate ratios and units. (TN Reading 3; TN Math N-Q)

13) Identify varieties, characteristics, and classifications of cheeses. Demonstrate in a live setting or presentation format the ability to follow procedures used to process, classify, and grade cheese, attending to appropriate ratios and units. (TN Reading 3; TN Math N-Q)

Processing and Evaluation of Poultry, Eggs, and Fish

14) Identify major poultry breeds and fish species utilized for meat and egg production. Describe the fabrication, processing, packaging, and quality analysis of poultry meat, eggs, and fish. (TN Reading 3)

15) Compare and contrast the carcass preparation and fabrication procedures in poultry and fish, addressing procedures specific to equipment, safety, sanitation, and quality control. Demonstrate in a live setting or in a presentation the ability to identify retail cuts of poultry, fish, and related by-products. (TN Reading 3)

16) Outline the United States Department of Agriculture (USDA) inspection procedures and system for classes, standards, and grades of poultry products and fish. Demonstrate in a live setting or in a presentation the ability to perform the evaluation and grading of carcasses and parts of chickens and turkeys, pre-cooked, further processed, and poultry meat products, providing written and oral justification for evaluation and grading scores. Evaluate and grade eggs for interior and exterior quality and provide written and oral justification for evaluation conclusions. (TN Reading 3; TN Writing 1, 4)

Processing and Evaluation of Vegetables, Fruits, and Nuts

17) Explain the processing, packaging, and quality analysis of vegetables, fruits, nuts and their by-products.

18) Describe preparation and processing procedures for vegetables, fruits, nuts, and their by-products, addressing procedures specific to equipment, safety, sanitation, and quality control. Research and cite texts explaining the use of various monitoring systems to appraise food quality, such as the Brix scale. (TN Reading 1, 8; TN Writing 4, 7)

Food Product Packaging and Labeling

19) Identify laws regulating the packaging and labeling of food products, and summarize industry requirements in an explanatory text. Demonstrate in a live setting or in a presentation the ability to perform packaging and labeling procedures for different food products. (TN Reading 2, 3; TN Writing 4)

20) Research storage and transportation issues pertaining to packaged food products and the extent to which noted evidence and reasoning justifies implications for safety and quality, citing specific examples from news media and academic journals. (TN Reading 1, 6, 8; TN Writing 7, 9)

Food Product Marketing

21) Write an informative essay illustrating the application of fundamental economic principles such as supply, demand, and profit to the food science industry. Describe marketing considerations and methods of merchandising food products. Discuss how quality and yield grade factors affect product marketing. Revise, edit, and rewrite essay with peer feedback. (TN Writing 2, 5)

22) Develop a food product and create a processing, packaging, and marketing plan incorporating the skills learned in this course. (TN Writing 2, 4)

Consumer Issues

23) Review data from news media and company product recall notices to explore consumer satisfaction issues. Cite specific evidence to assess the impact of organic, natural, ethnic, religious-based, and other specialized processing methods in the food industry. Compare and contrast the advantages and disadvantages of value added and specialty products and conduct research to evaluate and summarize consumer interest and trends related to these products. (TN Reading 1, 2, 9; TN Writing 7, 9)

24) Investigate the food product development process. Evaluate the use of food batch procedures for the purpose of economic efficiency. Describe the application of sensory evaluation methods to test food product flavor, appearance, and texture by quantitative description and simple difference testing. (TN Writing 8; TN Math N-Q)
25) Identify consumer concerns related to food quality and safety (such as antibiotic use, genetically modified organisms (GMOs), pesticide use, and food borne illnesses), and discuss the economic implications when low-quality and unsafe foods enter the market.

Standards Alignment Notes

*References to other standards include:

- TN Reading: Tennessee State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects; Reading Standards for Literacy in Science and Technical Subjects 6-12; Grades 11-12 Students (page 62).
    - Note: While not directly aligned to one specific standard, students who are engaging in activities outlined above should be able to also demonstrate fluency in Standards 4, 5, 6, and 10 at the conclusion of the course.
- TN Writing: Tennessee State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects; Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects 6-12; Grades 11-12 Students (pages 64-66).
    - Note: While not directly aligned to one specific standard, students who are engaging in activities outlined above should be able to also demonstrate fluency in Standards 3, 6, and 10 at the conclusion of the course.
- TN Math: Tennessee State Standards for Mathematics; Math Standards for High School: Number and Quantity, Algebra, Functions, Modeling, Geometry, Statistics and Probability.
    - Note: The standards in this course are not meant to teach mathematical concepts. However, the concepts referenced above may provide teachers with opportunities to collaborate with mathematics educators to design project based activities or collaborate on lesson planning. Students who are engaging in activities listed above should be able to demonstrate quantitative, algebraic, functional, geometric, and statistical reasoning as applied to specific technical concepts. In addition, students will have the opportunity to practice the habits of mind as described in the eight Standards for Mathematical Practice.
- SAE: Supervised Agricultural Experience: All Agriculture students are encouraged to participate in a Supervised Agricultural Experience program to practice and demonstrate the knowledge and skills learned in their agriculture courses.
- AFNR: National Agriculture, Food and Natural Resources (AFNR) Career Cluster Content Standards: Students engaged in activities outlined above should be able to demonstrate fluency in Standards ABS, CS, and FPP at the conclusion of the course.
- P21: Partnership for 21st Century Skills Framework for 21st Century Learning
    - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.